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ON THE VENOMOUS SERPENTS OF GEORGIA.

PART I.

Natural History and Physiology. By JOHN LE CONTE, M.D.,
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22 May 1853
Zoology 175
No class of animals has enjoyed so large a share of the marvellous as the snake, which, from the earliest times, excited the wonder, the respect, or the abhorrence of mankind. In antiquity, the Serpent played an important part in the systems of cosmogony and mythology. The facility and rapidity of its motions, although destitute of any external organs of locomotion;—the insidious stealthiness and noiselessness of its movements, as well as its voiceless character;—the remarkable brilliancy and beauty of some species, as contrasted with the dingy hideousness of others;—its extreme tenacity of life, frequently exhibiting signs of vitality after the most serious mutilations;—the extraordinary fecundity of many species;—the very striking phenomenon of a periodical exuviation of the entire skin, typifying a complete renovation of the animal system;—and, above all, the wonderful and truly incomprehensible lethiferous powers of some kinds, which enabled them to destroy the largest animals, by means of weapons which seem-

ed to be absolutely insignificant, and with a certainty and rapidity which appeared to be supernatural as well as superhuman:—constitute a combination of qualities and powers, well calculated to produce a powerful and vivid impression upon the imagination of primitive races of men. They would naturally look upon a class of creatures endowed with such extraordinary powers, as, in many respects, superior to man, and, consequently, as the appropriate type of some of the attributes of exalted beings.

Hence it is, that Serpent-worship (*Ophiolatreia*) is found to be a primitive form of idolatry, either actually or symbolically celebrated in the religious systems of almost every nation of the ancient world. From Babylonia, we may trace it East and West through Persia, Hindostan, China, Mexico and Peru, Britain and Gaul, Scandinavia, Italy, Illyricum and Thrace, Greece, Asia Minor and Phœnicia; and North and South through Scythia on the one hand, and Africa on the other. Some venerated it with unbounded horrors:—many of their Gods were accompanied by it as a type of wisdom; and several religions considered it emblematical both of a good and bad Deity. In the mythology of Egypt, Greece and Italy, the mystic Serpent consecrated almost every temple, attended upon almost every Deity; was imaged in the heavens, was stamped upon the earth, and characteristically appeared in every thing belonging to Tartarus. By some nations, as the Hebrews and Persians, it was the emblem of cunning, deceit, and wickedness; by others, such as the Egyptians and Phœnicians, it was looked upon in a double point of view,—as emblematic of the invincible power of royalty,—and likewise as a good genius (*Agathodemon*), and worshipped as the symbol of fertility and healing; while among the Greeks and Romans, it appeared under a variety of symbolic representations. As an accompaniment of *Æsculapius*, the Serpent was the well-known emblem of the healing art; and at the present time, a snake with its tail in its mouth is regarded as a symbol of eternity. The Serpent appears also to have held a place in the Hindoo, Mexican, and Scandinavian mythologies, where it was considered as the type of an evil Deity; and the tempter of mankind was represented under the same form. Even in

the early ages of the Christian church, a sect of the Gnostics called Ophites, worshipped the Serpent which tempted Eve as the father of all sciences.

At the present day, throughout the whole Christian as well as the Mohammedan world, snakes are looked upon with unmixed feelings of horror and detestation. The distinction between the venomous and non-venomous species—so well known to the Egyptians and other nations of antiquity—is almost universally disregarded;—fear and prejudice have combined to throw obliquy upon the whole order of Ophidian reptiles; and, by the general consent of society, every child is invested with the powers of indiscriminate destruction, to the great detriment of many really useful and harmless kinds of Serpents. It is in the highest degree desirable, that every intelligent person, and, especially every Physician, should be able to distinguish the dangerous from the innocuous species, in order to warn mankind against the real danger, and preserve them from groundless terrors. Ignorance on the part of the members of the medical profession in relation to this subject, is still more lamentable in another point of view:—it tends to foster and perpetuate error in regard to the treatment of snake-bites. A person receives a slight scratch on the leg from the bite of a harmless Serpent; he screams with fright;—his companions pronounce the snake poisonous, and it is destroyed;—the limb is ligatured, and, of course, swells and becomes edematous;—the physician is called in, administers some reputed antidote, removes the ligature, and the patient recovers;—and, finally, the case is published, forms an integral part of the medical experience of the day, and is cited as a valuable contribution to therapeutics. It is to be feared, that such instances are neither imaginary nor uncommon.

Without going into minuteness of detail, the following are a few of the most *general* physiological characteristics of the Ophidian reptiles. In common with many other members of the Class Reptilia, the heart consists of two auricles and one ventricle. The venous blood, collected from all parts of the body, accumulates in the vena cava, and thence passes into the right auricle. From the right auricle it passes into the single ventricle, and by it is impelled through the aorta into all parts

of the body. A small branch leads to the lung, and the blood, when purified, is returned to the left auricle, which drives it into the ventricle. This ventricle thus receives venous blood from one auricle, arterial from the other, and it is a mixture of this kind which is distributed through the body. In consequence of this incomplete circulation, the blood is imperfectly aerated, and the animal is cold-blooded.

The Serpents are especially characterized among Reptilia by having no sternum nor any vestige of a shoulder-blade, but whose ribs still surround a great part of the circumference of the trunk, and are only wanting at the tail. The vertebræ are curiously arranged:—the body of one is articulated by a convex surface to a cavity in front of the succeeding vertebra. This structure of ball-and-socket allows of free *lateral* motion; but the spinous processes of the back prevent motion, *up and down*, to any great extent. The third eye-lid and the tympanum are deficient; but the malleus of the ear exists under the skin, and its handle or shaft passes behind the tympanic bone. The left lung is generally abortive or rudimentary; and the respiratory motion is unassisted by a diaphragm, and is principally effected by the ribs and abdominal muscles.

The bones of the head, excepting in a few species, possess a great deal of mobility. The lower jaw, instead of a direct articulation with the upper, is brought into connection with it, through the medium of two bones, moveable on each other; and, in fact, the whole maxillary apparatus is conformably and peculiarly modified to permit the requisite distention of the soft parts surrounding the mouth, and the transmission of the undivided prey to the digestive cavity. But the mechanism by which this distention is accomplished,—and which is, in truth, a dislocation of the adapted parts, which return to their original positions after the act of deglutition is performed,—requires, to be well understood, a more particular description. The following is an abstract of the very clear account given by Prof. Richard Owen in his great work on “Odontography.” “The two superior maxillary bones have their anterior extremities joined by an elastic and yielding fibrous tissue with the small and single intermaxillary bone. The symphysial extremities of the lower maxillary *rami* are connected together by a simi-

lar tissue, allowing of a still wider lateral separation. The opposite or posterior extremity of each ramus is articulated to a long and movable vertical pedicle, formed by the tympanic or quadrate bone, which is itself attached to the extremity of a horizontal pedicle formed by the mastoid bone, so connected as also to allow of a certain yielding movement upon the cranium. The palatine and pterygoid bones have similar loose and movable articulations, and concur, with the other dentigerous bones of the mouth, in yielding to the pressure of large bodies with which the teeth may have grappled."

In Serpents, the male organs of generation are usually concealed within the cloaca: they are bifurcated and armed with recurved spines. The two penises are protruded from the two lateral commissures of the lips which bound the transverse opening of the cloaca. In the rattle-snake, the intromittent organs appear to be double on *each side*, from the great development of the bifurcations of the glans penis. It was this structure which led Dr. Edward Tyson to announce, that this snake had *four* penises. (*Phil. Trans.*, vol. 13, p. 25.)

But the most obvious as well as the most striking characteristic of Ophidian reptiles, is the total absence of any external members of locomotion. It is true, that in some genera (Boidæ) the hinder limbs are developed under the skin, formed of several bones, and ending in a short exserted spur or hook, placed one on each side of the vent; but they are so rudimentary as to be discoverable only on dissection or very close examination, and are used as organs of prehension rather than progression. Not a single species belonging to the Boidæ is found in the United States: our Serpents are, therefore, destitute of even rudimentary limbs. The popular idea that our common snakes possess distinct feet, which they may be made to exhibit under certain circumstances, especially when thrown into the fire alive,—has, doubtless, originated from the fact, that the bifurcated and thickened *penis* is protruded from the cloaca in such cases.

Although destitute of limbs, the usual organs of motion, yet some Serpents are capable of very rapid progression. This progression may take place in several ways:—thus, the body may be straightened out entirely in contact with the ground,

and a slow motion produced by the action of the scales and ribs, somewhat similar to that of the earthworm with its setæ. This mode of locomotion has been fully established by the observations of Sir Everard Home. (*Phil. Trans.* for 1812, p. 163.) Again, the body may be thrown into several undulations in a horizontal plane, the posterior of which is used as a fulcrum, or *point d'appui*, the straightening of the anterior must result in the advance of the head, which in turn is fixed, while the rest of the body is again flexed. This is the ordinary mode of progression. The opinion that, Serpents sometimes gather up the whole body into one *vertical* arch or hoop like a bent spring, the head and tail alone in contact with the ground and more or less approximated; and that by a sudden straightening of the hoop, they can progress with great rapidity:—is *probably erroneous*. We have already seen, that the arrangement of the spinous processes of the vertebral column limits the vertical flexion, and seems to forbid their progression by vertical undulations, as they are often represented in the older books of Natural History, and frequently on the stages of theatres. Snakes frequently spring upon their prey by throwing themselves into a coil,—which is done by contracting all the muscles on one side of the body,—and then, suddenly calling into violent action all the muscles on the opposite side, the whole animal is propelled, as if by the release and unwinding of a powerful spring, with an impulse which raises it to some height from the ground, and projects it to a considerable distance. But, assuredly, the Kangaroo performances of the rattle-snake,—reported from hear-say testimony by Prof. Benjamin Silliman,—which raised itself upon the extremity of its tail, and in this position, executed a series of extraordinary leaps, with sufficient rapidity to overtake a man running at full speed,—must lose its credibility in the same proportion as such a feat is perceived to be *mechanically* impossible. (Vide. *Silliman's Journal*, 1st series, vol. 2, p. 229.)

Before proceeding to an enumeration of the characteristic marks which distinguish the *Venomous* from the *Non-venomous* Serpents, it will be necessary for us to present our readers with an accurate Catalogue of all the Snakes which are known to inhabit the State of Georgia. This is rendered more impera-

tive from the fact, that the confusion of terms in the popular names is so inextricable, that, otherwise, I should find it difficult to designate the several species of Serpents. The presence or absence of noxious properties, leads to a very natural division of this tribe of reptiles into two great groups—viz: Venomous and Non-venomous Serpents. In the following Catalogue, we have appended the popular appellations as far as they are known.

Catalogue of Serpents inhabiting the State of Georgia.

VENOMOUS SERPENTS.

CROTALUS.—*Linnaeus*.

1. durissus.—*Lin.* Banded Rattlesnake.
2. adamanteus.—*P. de Beauvois.* Water Rattlesnake. Diamond Rattlesnake.

CROTALOPHORUS.—*Gray*.

3. miliarius.—*Lin.* Ground Rattlesnake.

TRIGONOCEPHALUS.—*Oppel*.

4. piscivorus.—*Lacépède.* Water Moccasin. Cotton Mouth.
5. contortrix.—*Lin.* Copper-head. Highland Moccasin. Rattle-snake's Pilot.

ELAPS.—*Schneider*.

6. fulvius.—*Lin.* Bead-snake.

NON-VENOMOUS SERPENTS.

COLUBER.—*Linnaeus*.

7. constrictor.—*Lin.* Black-snake.
8. guttatus.—*Lin.* Corn-snake. Red Chicken-snake.
9. couperi.—*Holb.* Indigo-snake. Gopher-snake.
10. punctatus.—*Lin.* Ringed-snake.
11. alleghaniensis.—*Holb.* Pilot Black-snake.
12. quadrivittatus.—*Holb.* Chicken-snake.

CORONELLA.—*Laurentius*.

13. getula.—*Lin.* Chain-snake. Thunder-snake. King-snake.
14. rhombo-maculata.—*Holb.*
15. doliata.—*Lin.* Bead-snake.

HELICOPS.—*Wagler*.

16. erythrogrammus.—*Daudin*.
17. abacurus.—*Holb.*

BRACHYORRHOS.—*Kuhl*.

18. amœnus.—*Say.* Red-snake.

CALAMARIA.—*Boie*.

19. elapsoidea.—*Holb.* Bead-snake.
20. striatula.—*Lin.* Brown-snake.

RHINOSTOMA.—*Fitzinger*.

21. coccinea.—*Blum.* Scarlet-snake. Bead-snake.

PITUOPHIS.—*Holbrook*.

22. melanoleucus.—*Daudin.* Pine-snake. Bull-snake. Horn-snake.

PSAMMOPHIS.—*Boie*.

23. flagelliformis.—*Catesby.* Coachwhip-snake.

LEPTOPHIS.—*Bell*.24. *æstivus*.—*Lin*. Green-snake. Grass-snake.25. *sauritus*.—*Lin*. Ribbon-snake. Garter-snake.TROPIDONOTUS.—*Kuhl*.26. *fasciatus*.—*Lin*. Water-snake. Water-moccasin.27. *erythrogaster*.—*Shaw*. Copper-belly. Water-moccasin.28. *taxispilotos*.—*Holb*. Water-snake. Water-moccasin.29. *rigidus*.—*Say*.30. *sirtalis*.—*Lin*. Striped-snake. Garter-snake.31. *ordinatus*.—*Lin*. Grass-snake. Garter-snake.HETERODON.—*Palisot de Beauvois*.32. *simus*.—*Lin*. Hog-nose-snake.33. *niger*.—*Catesby*. Black-viper. Spreading-adder.34. *platyrhinus*.—*Latreille*. Hog-nose-viper.OPHISAURUS.—*Daudin*. (Not properly a *Serpent*.) *ventralis*.—*Lin*. Glass-snake.

The foregoing Catalogue shows, that our Fauna is comparatively rich in this order of reptiles. Omitting the Ophisaurus,—which can scarcely be considered a Serpent,—Prof. J. E. Holbrook has described, in his “North American Herpetology,” 47 species of Ophidian reptiles as inhabiting the United States; and of these, 10 belong to the Venomous group. Dr. J. E. De Kay found but 16 species inhabiting the State of New York; of which, 2 are Venomous. It will be perceived, that there are 34 species of Serpents inhabiting the State of Georgia; and of these, 6 kinds come under the Venomous division. It is, therefore, sufficiently obvious, that we enjoy the company of a large share of the species composing this order of vertebrata. It is proper to observe, however, that, of the 6 species classed among the Venomous, *two* of them,—*Crotalophorus miliarius* and *Elaps fulvus*,—can scarcely be considered dangerous to man. The former, is greatly dreaded by the common people, as it gives but a very slight warning with its diminutive rattle, and is frequently the aggressor. Its bite is very poisonous, is generally followed by violent *local* inflammation, and even by gangrene and sphacelus; nevertheless, as the snake is small, the quantity of venom is insufficient to produce death in large animals. As for the *Elaps fulvus*, although it is furnished with an immovable fang on either side of the upper jaw, yet the *poison gland* is probably in a rudimentary condition. It is almost universally considered perfectly harmless, and is constantly handled with impunity. It seems to have been

placed among the venomous snakes, more from the fact, that it is the Northern representative of the dreaded *Elaps lemniscatus* of South America, than the possession of any noxious qualities. According to the best observations, it cannot be induced to bite under any provocation whatever.

There are, consequently, but 4 species of our Serpents, which can be considered *dangerous* to man. Moreover, from the well-ascertained fact, that the venomous snakes are endowed with powers of fecundity, far *inferior* to the harmless ones, they are nothing like so numerous. The rattle-snakes rarely produce over 9 or 10 at a birth, while 81 living garter-snakes (*Tropidonotus sirtalis*) have been taken from a single individual. From this fact, it is comparatively *seldom*, that the poisonous Serpents fall under observation. The universal dread in which they are held, has enormously exaggerated the number and abundance of these reptiles. Every one who has resided many years on the sea-coast of Georgia, has, doubtless, seen a great number of Rattle-snakes; but it would be very erroneous to make this a measure of their comparative abundance. Every specimen which falls a victim to man, is brought home in triumph, and all the neighbors must see the dreaded monster. In this manner, I have had numerous opportunities of seeing them:—nevertheless, during many years rambling—at all seasons—through the woods on the sea-coast of our State, I have never met with but *one* Rattle-snake. Other persons may have been more fortunate; but I apprehend, that the number furnished by each man's *personal* experience, would be comparatively small.

Again, the relative abundance of our Venomous snakes has been vastly multiplied, from the fact, that several of our most common harmless Serpents, have been, almost universally, confounded with their dangerous congeners. The dread of the fatal *Trigonocephalus piscivorus* has brought into suspicion and disrepute several other snakes that live in the same localities and possess a greater or less similarity of appearance and habits,—as the *Tropidonotus fasciatus*, *T. erythrogaster*, and *T. taxipilotus*, (constituting our most abundant water-snakes), which are not only harmless, but really useful in destroying vermin. They are all called “Water Moccasins,” and are indiscriminately dreaded and detested.

Nothing can be more ridiculous than a fear of the common Water-snakes, chicken-snake, green-snake, black-snake, and other species. Even should they be forced to bite in self-defence, the wound can never be more serious than a similar scratch of a pin or of a point of a knife. The same may be said of the *blowing or hissing* snakes of the genus *Heterodon*, usually termed *Viper* or *Adder* in the United States, and which present a formidable appearance from the power they have of flattening the head and anterior part of the body when irritated. Some of the species coil themselves when disturbed, assume a threatening attitude, by flattening the head and neck, which they lift and wave with an undulating motion, hissing loudly at the same time, and projecting the head towards the object of its annoyance; but they cannot be provoked to bite or even to open the mouth. These snakes are very generally regarded as venomous. This unjust obliquy has, doubtless, been, to some extent, perpetuated, by the fact that some of the species are vulgarly called *Vipers* or *Adders*:—thus associating them with the really venomous European *Vipers*. The common *Black-snake* is generally known to be perfectly harmless:—nevertheless, it is active, bold, and, sometimes, quite impudent; refusing to give way to man. Numerous stories are current of their pursuing individuals. It is quite possible that, under some circumstances, they may follow after a person who flies in terror before them; but such is not the experience of the herpetologist, with whom the case is exactly reversed:—the snake here being usually the *fugitive*, and too often escaping by his superior agility, and thus eluding the just claims of science to his body.

Distinctive Characteristics of our Venomous Serpents.

It is not my purpose to give detailed scientific descriptions of the dangerous snakes inhabiting our State. To the naturalist and man of science who has access to books on herpetology, this would be a work of supererogation; while to persons not versed in the technicalities of zoology, it would be as useless as unintelligible. It is my object, to call attention to a few of those *general* distinctive characteristics, which are readily recognized by casual observation.

1. RATTLES.—The several species of *Crotalus* and *Crotalophorus*, are readily and most obviously distinguished from all other Serpents, whether dangerous or harmless, by the remarkable *rattle* at the extremity of the tail. This singular appendage is made up of many pieces, from one to 30 or more, which are perfectly similar to each other in their form, and are articulated together by a very beautiful mechanism. The piece of rattle immediately connected with the body seems to be moulded on the last vertebra of the tail, which it encloses, and from which it is only separated by an interposed layer of the dermis or true skin, by which it is secreted. Its surface presents three nearly circular elevations corresponding to three protuberances:—of these, the first, or that nearest to the body of the animal, is the largest; the other *two* rings are encased in the succeeding piece, which is connected in a similar manner to the next ring, and so on throughout the series;—the posterior two-thirds of each piece being embraced by the following, so that of the three prominent rings that project from each piece, only the *anterior* is visible, the two posterior being contained in the next element of the rattle; excepting the ultimate one, in which all of the three protuberances are exposed to view. The last two rings of each piece thus enclosed in the first two of the succeeding, retain it in its place; but as the diameter of the former is less than that of the latter, each piece is quite loose and plays freely about upon that which it envelopes. None, except the first are connected with the skin of the animal by any muscle, nerve, or vessel. It is, therefore, merely an external appendage of the corneous cuticle, moved, as any foreign body would be, when the end of the tail is agitated. The pieces of the organ are formed successively on the skin of the tail, receiving from it the materials necessary for its development, and adhering to it until its growth is complete. A second piece, entirely similar to the first, is formed under it, and detaches it from the end of the tail. It is pushed backwards, leaving between its edge and the skin an interval occupied by the first ring of the new piece. A third piece is formed under the second, pushing it backwards, but retaining it, by its posterior rings being included in the cavity of the second piece. If the vertebræ of the tail continue of uniform

diameter, all the pieces will be of the same size, and the rattle, consequently, is of one breadth throughout. On the contrary, if the vertebræ grow while the rattle is in process of formation, the pieces increase in size, and thus it tapers to its end. It is very evident, from what has preceded, that the rattle is nothing more than a modification of the corneous epidermis of the tail, and that the only reason why it is not thrown off at each periodical moulting, is, that its *mechanical connections* prevent such a result. It is also obvious, that only one piece can be found at each exuviation of the cuticle. The idea that the number of rattles mark the age of the snake, is unquestionably erroneous. Dr. Holbrook has known *two* rattles added in one year, and Dr. Bachman has observed *four* produced in the same length of time. On the other hand, the rattles are liable to be lost. Mr. Peale, of the Philadelphia Museum, kept a living rattlesnake 14 years;—it had, when it came into his possession, *eleven* rattles; many were lost, and new ones were formed, so that at the end of the time, there were still *eleven* pieces.

2. REPRODUCTION.—All of our poisonous snakes are viviparous, or rather, ovo-viviparous. Not that their mode of reproduction is really different from that of the oviparous serpents, but that the eggs are developed and hatched in the oviduct before exclusion from the body, so that the young animals are expelled alive. It is, therefore, essentially *oviparous*, and must not be mistaken for the viviparous *placental* reproduction of mammalia. Among Serpents, as with birds, the development of the embryo is complicated by the presence of an allantois, and the amniotic sac with its peculiar liquid. As the period of hatching approaches, the yolk bag, or vitelline sac, together with its remaining contents, is gradually taken into the cavity of the abdomen, through the umbilical aperture. Should the young snake be hatched before this sac is completely drawn into the abdominal cavity, its presence *externally*, might, very naturally, lead to the erroneous conclusion, that it possesses a *true placenta with an umbilical cord attached*.

This ovo-viviparous peculiarity appertains to *all* venomous Serpents, and hence, they have been included under the family

Viperidæ. Nevertheless, it is important to bear in mind, that *it is not restricted to them*. With us, some of the harmless species,—as the different kinds of *Tropidonoti*,—are likewise ovoviviparous. With some, it appears to depend, in a measure, upon the latitude, mean temperature, and the greater or less abundance of food; so that the same snake may be made oviparous at one time, and ovo-viviparous at another, merely by altering the circumstances, so as to accelerate or retard the period of extruding the eggs.

3. HEAD.—The head of our venomous Snakes is disproportionately large, triangular, rounded or truncated anteriorly, and flattened above. The enormous breadth of the posterior part, as contrasted with the remarkably small and contracted neck, gives a *hastate* appearance to the head. This peculiar conformation of the head seems to be connected with the wonderful distensibility of the several parts composing the cranium, requisite for swallowing the large animals on which these Serpents prey. To this end, the tympanic bones,—which connect the *rami* of the lower jaw with the posterior part of the cranium,—are enormously elongated. This gives great width to the posterior region of the head; which is still farther increased, by the presence of the large poison gland on either side behind the eye. Armed with the power of destroying comparatively large animals, nature has invested them with a conformation admirably adapted for transmitting the undivided victim to the digestive cavity. Nothing is more common than for our Rattlesnakes to swallow full-grown rabbits.

This distinctive mark, founded upon the peculiar shape of the head, does not belong to *all* poisonous Serpents, but is quite characteristic of those inhabiting our State. The Elaps is the only exception; which, as we have seen, is probably innocuous. Among the harmless snakes, the several species constituting the genus *Heterodon*, are the only ones in which, the character of the head is liable to produce an erroneous impression. Some of these have the head large, flattened, triangular, and broader behind:—but then, *the enormous size of the neck*, (as large as the head,) and the *pointed snout turned upwards at the tip*, will readily distinguish them from their dangerous congeners.

4. SCALES ON THE HEAD.—All of our Venomous snakes, excepting the Elaps, have a great portion of the superior region of the head covered with *scales* instead of *plates*; a mechanism which appears to be conformable to the extreme dilatability of the parts, to which reference has been made. In the Crotalus, this peculiarity is very conspicuous, inasmuch as the scales cover the *vertex* as well as the occiput, extending anteriorly as far as the eyes; the front being the only part covered with plates. In the Crotalophorus and Trionocephalus, the scales do not extend so far forward; and consequently, this character becomes less striking. In fact, as a similar arrangement in the anterior extension of the scales of the neck exists, to some extent, in the innocent Heterodon, it loses more or less of its value as a distinguishing mark between this genus, and the Trionocephalus.

5. PIT BETWEEN THE EYE AND THE NOSTRIL.—In all of our poisonous Serpents,—the Elaps being excepted,—there is a *deep pit or fossa*, of considerable size, situated on each side between the eye and the nostril, which penetrates in the direction of the poison apparatus, at the base of the fang. Dr. Tyson first pointed out the fact, that these orifices have no connection with the organs of hearing, and that they led into cup-like cavities formed by the bones of the skull and those of the upper jaw, which were not perforated. (*Phil. Trans.*, vol. 13, p. 26.) Many years later, they were more minutely described by Sir Everard Home. (*Phil. Trans.*, for 1804. p. 72.) It seems that, these pits are found in several different genera of Venomous snakes, and that, they have never been seen in any of the Non-venomous species. The teleological import of these pits is not understood. They have no direct communication with the cavity containing the poison, but are connected with the lachrymal passages. Dr. Richard Harlan having invariably found an exceedingly delicate transparent membrane over the osseous cavity in the bone at the base of the fang, has suggested; that, “this membrane, whilst it intercepts any direct communication between the sack and the external canal, might at the same time permit the action of the atmosphere on the fluid contained in the sack, and thus change its chemical properties.”

(*Trans. of Amer. Phil. Society*, New Series, vol. 3. p. 311. 1830.) This conjecture appears to receive some support from the general opinion, that the *activity* of the poison is increased by long retention.

6. UNDIVIDED SUBCAUDAL PLATES.—All of our Venomous snakes,—the Elaps being excepted,—have broad *undivided plates* under the tail posterior to the vent, similar to those under the abdomen. Sometimes a few of the plates are *bifid* near the extremity of the tail. All of our Non-venomous Serpents, *without a single exception*, have the subcaudal plates *bifid or divided* as far forward as the transverse slit of the vent. This is *not* an absolutely *general* distinctive mark between Venomous and Non-venomous snakes ; but, with respect to those inhabiting Georgia, *it is absolute* and highly characteristic.

The *six distinctive external characters* as above given, are abundantly sufficient to distinguish the dangerous from the harmless Serpents inhabiting our State. But the arrangement of the teeth and the organization of the mouth, constitute the most important marks of distinction. The character most commonly adduced from the dental system, as distinguishing the Venomous from the Non-venomous snakes, is, that the former have *two*, the latter *four* rows of teeth in the upper jaw ; the two outer or maxillary rows being wanting in the Venomous species, and their place being supplied by a single poison fang. Prof. Owen has shown, that this *is not* an infallible character ; inasmuch as some poisonous snakes, have large immovable fangs associated with a greater or less number of maxillary teeth. Among *our* Serpents, the Elaps is the only one thus organized ; and we have seen that it is not dangerous. In all of our truly Venomous snakes, the poison-fangs are associated only with their successors ; constituting all of the teeth attached to the maxillary bones, which are here shortened to mere tubercles on the anterior and lateral portion of the head. Consequently, only the *two* rows of *palatine teeth* are seen in the roof of the mouth ; the arrangement of teeth in the *lower jaw*, is the same in all Serpents.

These isolated fangs are usually said to be movable ; but, as M. Cuvier remarks, it is, properly speaking, the exceedingly

short maxillary bone that moves. The structure of the venom-fangs of Serpents, and the machinery by which their deadly agency is brought to bear against those who are so unfortunate as to be the objects of their attacks, are so interesting, that, with the assistance of Prof. Owen, we will endeavor to lay before our readers as clear a description of them as possible. —

1. MACHINERY FOR ERECTING THE FANG.—The superior maxillary bone diminishes in length with the decreasing number of teeth which it supports. The transverse or external pterygoid bone elongates in the same ratio, so as to retain its position as an abutment against the shortened maxillary, and the muscles implanted into this external pterygoid style communicate, through it, to the maxillary bone the hinge-like movements backwards and forwards upon the ginglymoid articulations connecting that bone with the anterior frontal and palatine bones. As the fully-developed poison fangs are attached by the same firm basal ankylosis to shallow maxillary sockets, which forms the characteristic mode of attachment of the simple or solid teeth, they necessarily follow all of the movements of the superior maxillary bone. When the external pterygoid is retracted, the superior maxillary rotates backwards, and the poison fang is concealed in the lax mucous gum, with its point turned backwards. When the muscles draw forward the external pterygoid, the superior maxillary bone is pushed forwards, and the recumbent fang withdrawn from its concealment and erected.

In this power of changing the direction of a large tooth, so that it may not impede the passage of food through the mouth, we may perceive an analogy between the typical genera of venomous snakes and the *Lophius*; but in the fish, the movement is confined to the tooth alone and is dependent on the mere physical property of the elastic medium of attachment; in the Serpent, the tooth has no independent motion but rotates with the jaw, whose movements are governed by muscular actions. In the fish, the great teeth are erect, except when pressed down by some extraneous force. In the Serpent, the habitual position of the fang is the recumbent one, and its erection takes place only when the envenomed blow is to be struck.

2. STRUCTURE OF THE FANG.—That the poison fangs of venomous snakes are perforated, with the view of injecting the venom into the wound, was very well known to the ancients:—Galen tells us, that the mountebanks of his day used to stop these perforations with some kind of paste; after which, they would publicly expose themselves to be bitten without danger. But the peculiar structure of these organs was first described by Redi and Fontana. A true idea of the structure of a poison-fang will be formed by supposing a simple conical tooth to be pressed flat, and its edges to be then bent towards each other, and soldered together so as to form a hollow cylinder, or rather cone, open at both ends. The flattening of the fang and its inflection around the poison-duct commences immediately above the base, and the suture of the inflected margins runs along the anterior and *convex* side of the recurved fang: the poison-canal is thus in *front* of the pulp-cavity. The basal aperture of the poison-canal is oblique, and its opposite outlet is still more so, presenting the form of a narrow elliptical longitudinal fissure terminating at a short distance from the apex of the fang. It is more strongly curved backwards than the ordinary teeth, but its acute and slender apex is frequently bent slightly in the contrary direction, as in the rattlesnake.

The duct which conveys the poison, although it runs through the centre of a great part of the tooth, is nevertheless, as we have seen, really on the *outside* of the tooth; the canal in which it is lodged and protected being formed by a longitudinal inflection of the parietes of the pulp-cavity or true internal canal of the tooth. This inflection commences a little beyond the base of the tooth, where its real nature is readily appreciated, as the poison-canal there rests in a slight groove or longitudinal indentation on the *convex* side of the fang:—as it proceeds, it sinks deeper into the substance of the tooth, and the sides of the groove meet and coalesce, so that the trace of the inflected fold ceases, in some species, to be perceptible to the naked eye; and the fang appears, as it is commonly described, to be perforated by the poison-duct.

3. POISON GLANDS.—According to Prof. Müller, the poison glands occupy the sides of the posterior half of the head; each

consists of a number of narrow elongated lobes, extending from the main duct which runs along the lower border of the gland upwards, and slightly backwards. Each lobe gives off lobules throughout its extent, thus presenting a pinnatifid structure; and each lobule is subdivided into smaller secerning cæca, which constitute the ultimate structure of the gland. The whole gland is surrounded by a double aponeurotic capsule, of which the outermost and strongest layer is in connection with the muscles, by whose contraction the several cæca and lobes of the gland are compressed and emptied of their secretion. This is then conveyed by the duct to the basal aperture of the poison-canal of the fang. We may reasonably suppose that the rage which stimulates the venom-snake to use its deadly weapon must be accompanied with an increased secretion and great distention of the poison glands; and as the action of the compressing muscles is contemporaneous with the blow by which the Serpent inflicts its wound, the poison is, at the same moment, injected with force into the wound from the apical outlet of the perforated fang.

4. REPLACEMENT OF FANGS.—In the typical and most deadly venom-snakes—such as the *Crotalus* and *Trigonocephalus*,—the poison-fangs acquire their largest size, and are associated only with their successors, destined to replace them should these be destroyed by accident. These are clustered in greater or less number behind the fully-developed fang, presenting the same structure, but of a size proportionate to their degree of development, and further differing in being loosely imbedded in the thick and wide mucous gum, which likewise conceals the fixed and functional fang in its ordinary position of retraction and repose. It thus appears, that in the posterior part of the large mucous sheath of the poison fang, the successors of this tooth are always to be found in different stages of development. The pulp is at first a simple papilla, and when it has sunk into the gum the succeeding portion presents a depression along its inferior surface, as it lies horizontally, with the apex directed backwards: the capsule adheres to this inflected surface of the pulp. But how the cylindrical cavity of the dilated fold is occupied in the loose growing poison-fang, and by

what contrivance it is brought into the same relation with the severed duct of the poison gland as the displaced fang which it succeeds, *is not yet clearly understood*. (On the foregoing points, vide Owen's "Odontography," *Passim*, and Todd's "Cyclopaedia of Anatomy and Physiology," Articles, "*Reptilia* and *Teeth*.")

HABITS OF OUR VENOMOUS SERPENTS.—We will conclude this Paper with a few observations on the *habits* of each of the *four* species of dangerous snakes inhabiting Georgia. On this point,—as well as on many others to be noticed in a future communication,—I must express my profound obligations to my friend W. E. Dearing, M. D., of Augusta, Georgia. For many years he has studied the habits of our Ophidian reptiles with an assiduity and discrimination beyond all commendation. Endowed by nature with an intuitive *power of taming*, he has collected and domesticated a great number of our snakes, and has, thus, been able to investigate their habits, under the most favorable circumstances. This has been done in the face of popular prejudices which were so strong, as to characterize such studies,—so foreign to the spirit of utilitarianism,—as little else than manifestations of mental hallucination.

1. CROTALUS DURISSUS.—This snake lives on rabbits, squirrels, rats, etc., and is a remarkably slow and sluggish animal, lying quietly in wait for his prey, and permitting any one to pass within a few feet of him unmolested. When suddenly disturbed, he generally throws himself into a coil, and warns the aggressor by rapidly vibrating his rattles; but Dr. DeKay records a case in which an Indian was struck without the slightest warning. (*Nat. Hist. of New York*, "Zoology.") It is a very commonly received opinion, that the rattlesnake never strikes unless *coiled*; so that if once thrown from this position, he may be approached without danger. But Dr. Dearing has seen them strike repeatedly without coiling.

The Hon. Paul Dudley informs us, that these Serpents rattle most fiercely in clear fair weather. When rainy, they make no noise; for which reason, he affirms, the Indians do not like to travel in the woods in rainy weather. (*Phil. Trans.* vol. 32,

p. 292.) According to the observations of Dr. Dearing, they will rattle in all kinds of weather; but the sound is comparatively feeble when the atmosphere is moist. He assigns a *physical cause* for this fact, which affords a perfectly satisfactory explanation of the phenomenon. Owing to the strongly *hygroscopic properties* of the corneous rattle, it becomes quite *soft* when the atmosphere is damp, and, consequently, its vibration produces a comparatively feeble sound.

2. *CROTALUS ADAMANTEUS*.—This terrible snake is restricted to the Southern States. It chooses for its abode, damp and shady places, keeping constantly near the water, from which circumstance it is sometimes called the "Water-rattle;" although, as Prof. Holbrook says, there is no evidence of its taking to the water in search of prey. In other respects, its habits are similar to the preceding species.

3. *TRIGONOCEPHALUS PISCIVORUS*.—This snake is found about damp, swampy places, or in water;—far from which it is never observed; and hence, called "Water Moccasin." It lives on fish, frogs, toads, tadpoles, and many of the smaller reptiles. This Serpent is very vicious,—attacking every thing that comes within his reach—and its bite is justly dreaded. The tail is terminated by a small *horny point*, about half an inch in length, which seems to be the *homologue* of the rattle of the preceding genus. This excrescence, though perfectly harmless, has, according to the older writers, given a dreadful character to its owner, imposing a belief on the credulous, that he is the terrible Horn Snake, armed with death at both ends. Lawson informs us, that he "heard it credibly reported by those who said they were eye-witnesses, that a small locust tree, about the thickness of a man's arm, being struck by one of these snakes at 10 o'clock in the morning, then verdant and flourishing, at four in the afternoon was dead and the leaves red and withered." (*Lawson's New Voyage to Carolina*, p. 130.) The foregoing story is only surpassed by one recorded by Sir Hans Sloane: Col. James Taylor of Metapony, told Col. Beverley, that, having found a rattlesnake, they cut off his head with three inches of his body. A green stick, the bark being

peeled off, was put to the head; it bit it. Small green streaks were observed to rise up along the stick towards the hand. The Col. threw the stick down, and, "in a quarter of an hour, the stick, of its own accord, *split* into several pieces, and fell asunder from end to end." (*Phil. Trans.*, vol. 38, p. 321—*cited from Beverley's Hist. of Virginia*, 2d Ed., p. 260.) When such absurd and preposterous notions find a place in grave philosophical transactions, it is not at all astonishing, that "Snake Stories" should have become typical of everything incredible.

4. *TRIGONOCEPHALUS CONTORTRIX*.—This reptile chooses dark and shady places for its residence in general, though at times it is found in meadows of high grass. Dr. Dearing has frequently observed it about fallen timber and old deserted houses. Its usual food seems to be field-mice, wood-rats, and small birds. This snake is equally as vicious as the preceding, and its bite is considered very dangerous.

It has long been a popular belief,—in relation to the European Viper, as well as our Rattlesnakes,—that, when the female is suddenly surprised, she opens her mouth and permits her young to *run down her throat*. The English viper-catchers deny that any such thing ever happens; and I have been disposed to ascribe the origin of the opinion to the fact, that, these Serpents being ovo-viviparous, they are sometimes found with the young in the oviduct; which might lead persons to suppose that they were in the stomach. But the following account given by the well-known French naturalist and traveller, M. Palisot De Beauvois, is so *direct and positive*, that my faith in the above explanation has been shaken. He asserts, "that he saw a large Rattlesnake, which he happened to disturb in his walks, coil itself up, open its jaws, and instantly receive small ones, which were lying by it, and instinctively rushed into its mouth. M. De Beauvois retired, and watched the snake, and in about a quarter of an hour after, saw her discharge them. He then approached a second time, when the young retired into its mouth with greater celerity than before; and the snake immediately moved off in the grass and escaped." (Rees' "Cyclopædia." Am. ed., Art. *Crotalus*; cited from Amer. Phil. Trans.)

As regards the "Fascinating" or "Charming" power of snakes, it is now generally considered a *fable*: a modification, as Prof. Holbrook suggests, of that of the *basilisk* of the ancients, "a creature whose deadly glance would alone prove fatal." The curious behavior of birds and some of the smaller animals, when in the vicinity of these reptiles, is more rationally explained by supposing that they are victims to maternal solicitude, or, that they are bewildered and paralyzed with terror, in suddenly finding themselves in the presence of an enemy of such threatening aspect,—rather than to imagine them to be endowed with a mysterious and indefinable influence over their weak and defenseless prey. In those cases in which the animal has been observed to struggle and *die*, under the gaze of the snake distant several yards,—it is probable, that the victim had been previously *struck*, and the serpent was quietly awaiting the result of the envenomed blow.

Capt. Richard F. Floyd, of Camden county, Georgia, in a very interesting letter to Rev. James H. Linsley, says, "I have often drawn near the rattlesnake and looked it steadily in the eye until the intensity of my gaze became confused and dim from the most natural cause, without having any strange effect produced upon me." (vide *Silliman's Journal*, 1st series, vol. 46, p. 45, Note. 1844.) Some have imagined that their victims are overpowered by the horrible *stench*, which they are capable of emitting from their bodies. But it seems to me very doubtful, whether this effluvium is *ever* thrown off except for purposes of *defense*, as the polecat does; and even if it was emitted under other circumstances, it is still more problematical, whether it could, by any possibility, have an *intensity* so great as *instantly* to overpower the animal, and prevent its escape.

It is a popular opinion, that *hogs* are particularly destructive to these reptiles, and that they are quite invulnerable to snake-bites. There can be no doubt, that these pachyderms are very seldom killed by the bite of venomous serpents:—Dr. Dearing has known *two* instances in which they have been bitten, without the slightest injury. Doubtless this arises from no special immunity from the effects of the poison; but from the fact, that the slight vascularity of the skin, and the thick external

layer of *fat*, prevent the venom from finding its way into the circulation. If struck under favorable circumstances, they would be killed. Dr. De Kay was informed by a respectable farmer in Dutchess Co., N. Y., that he lost three hogs in one season by the poison either of the copper-head or rattle-snake. (Nat. Hist. of New York. "Zoology.")

It is likewise a popular belief, that the poisonous Serpents are often killed by the common Deer (*Cervus virginianus*), which leap on them, with all four feet touching each other, and off, so quick, that the snake has no power to bite, and this he repeats until he completely dispatches him. Mr. Linsley says that, "Mr. George Walter assures me that he witnessed this fact this season in Missouri, while secreted in the bushes near the operation." (Vide, *Silliman's Journal*, 1st series, vol. 46, p. 44. Note. 1844.) Dr. Dearing informs me, that he has frequently seen domesticated deer kill various species of the common snakes by leaping on the body or head; but has never seen them perform the operation on the venomous serpents. A few astute lexicographers have been able to discern in the Greek word for the *stag*, "*Elaphos*," a very early, if not an *intuitive*, knowledge of this remarkable habit of the cervine tribe. For example, the learned Schrevelius derives this word from "*Elein*," and "*Opheis*," "*quod serpentes è cavernis trahat*." It is true, that to those who are not initiated in the mysteries of philology, it would seem *primà facie* probable, that the progenitors of the Greeks would have given a *name* to the stag *long before* they had observed such a *habit* in the animal:—but in a science in which *vowels have no power* and *consonants are interchangeable*,—what may we not expect a prolific classical imagination to accomplish?

Athens, Georgia, Sept. 20th, 1853.

ARTICLE XXXVI.

Soothing Liniment—proposed by Dr. T. DOUGLASS, of Alexander, Burke Co., Ga.

Prof. GARVIN:

My Dear Sir—I beg leave to present you, for examination and trial, a small specimen of a saponaceous compound which,

on account of its very prompt and soothing qualities, I have honored with the name of *Lethean Liniment*.

It is made by digesting a bar of fresh turpentine soap and four ounces of gum of camphor in a gallon of good alcohol for two weeks in the heat of the sun. It is then bottled up while hot, and one drachm of chloroform added to every four ounces, set in a cool place, and shaken occasionally while coagulating.

The turpentine affords the best means, in my opinion, of applying chloroform to the skin, because, by its adhesiveness it holds that volatile fluid longer and more firmly in contact with the surface than any other substance could do.

My mode of applying it, is to coat the part well with the liniment and cover it immediately with a piece of good paper, which adheres firmly and produces a gentle burning, tingling sensation, which, in neuralgia, rheumatism, irritability of the stomach, cramp colic, &c., is perfectly delightful.

Did I think more of money than of honor and humanity I might possibly make this compound avail me something. But since I do not wish to become a competitor with all the host of pain-killers and extractors and eradicators in the country, you may, if you think it worthy of a trial by our noble profession, hand it over to Professor Dugas for publication in the Southern Med. and Surg. Journal.

Very respectfully,

TILMAN DOUGLASS, M. D.

PART II.

Eclectic Department.

Letters upon Syphilis. Addressed to the Editor of L'Union Médicale, by P. RICORD. Translated from the French, by W. P. LATTIMORE, M. D.

TWENTY-SECOND LETTER.

[Continued from Page 600.]

My Dear Friend—It would afford me much pleasure to say a word relative to the treatment of chancre; but you know that, according to the plan I have proposed to follow, I cannot, in this connection, enter into many details.

Perhaps you will permit me to say something here in relation to prophylaxis. Medical police has advanced much of